

ENDOCRINE SYSTEM

Progestational hormone

progesterone

TANISHA SACHAN

AIR 1747

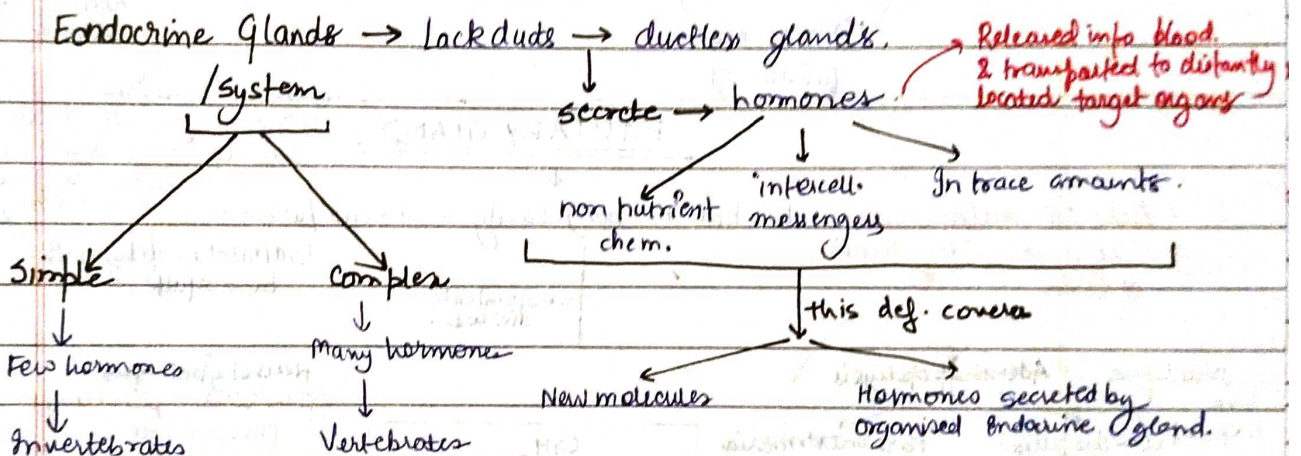
NCERT THREAD NOTES

Neural system → point-to-point
Rapid Co-ord.
Fast
Short lived

Nerve fibres do not innervate all the cells of body & the cellular functions need to be regulated → Thus came Endocrine System

↓ carried by
Hormones.

jointly co-ord. & regulate physiological func. in body



Human Endocrine System →

Endocrine glands

↓
Organised

Pituitary

Pineal

Thyroid

adrenal

pancreas

parathyroid

Hypothalamus

Gonads

hormone producing diffused tissue/cells located in diff parts of body

* In addition to these → some other

organs

- ① Gastrointest. tract
- ② Liver, Kidney
- ③ heart

→ hormones

Hypothalamus not written here in NCERT mentioned separately as "of all major endocrine glands & hypoth."

HYPOTHALAMUS

Basal part of diencephalon (forebrain)

Regulates wide spectrum of body funct.

Contains several groups of neurosecret. cells

"nuclei"

hormones

Regulate the synthesis & secretion of pituitary hormones

Releasing hormone

stimulate pit. secretion

GnRH → stimulate gonadotrop. release from pit.

Inhibiting hormone

Inhibition of pit. secretion

Somatostatin → inhibits the growth hormone release from pit.

Ant. pituitary → Hormones reach through portal circulatory system

regulate the function of.

Post. pituitary → Under direct neural reg. of hypothalamus.

PITUITARY GLAND

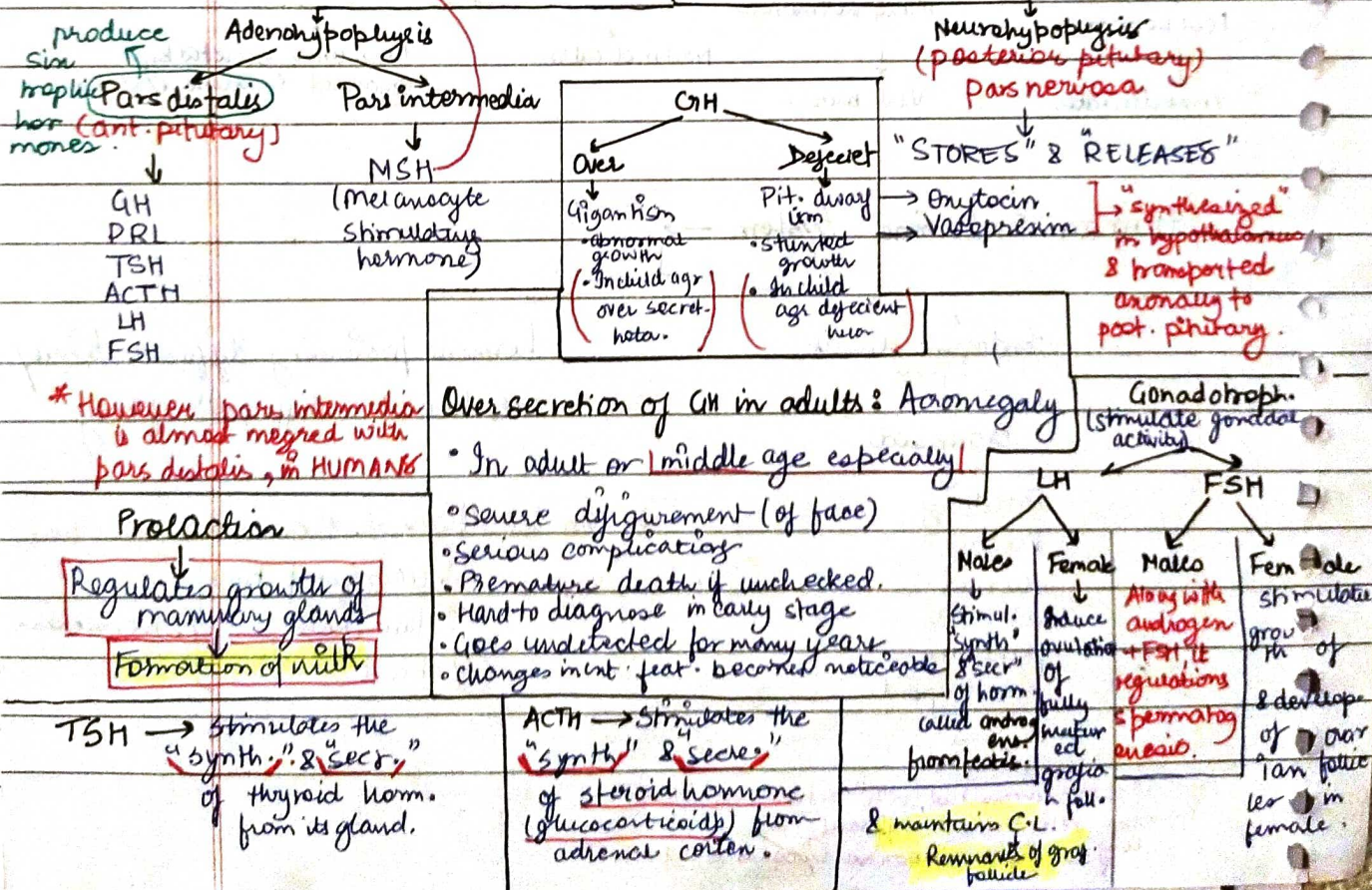
hormones from it regulate growth & activities develop. of somatic tissues & activities of peripheral endocrine glands

- Acts on melanocyte
- Regulate pigmentation of skin

Located in bony cavity → sella turcica

Attached to hypoth. by a stalk.

anatomically divided.



Oxytocin → Acts on smooth muscle → cause contraction
 Pitocin → In Females → stimulates a vig. contr. of uterus at child birth
 → milk ejection from mammary gland.

Vasopressin → Acts on kidney → Stimulates reabsorption of water & electrolytes by distal tubules & thereby reduce loss of water through urine (diuresis).
 ADH

* Impairment affecting synth. or release of ADH → water loss & dehydo. → Diabetes insipidus

THE PINEAL GLAND

TANISHA SACHAN

AIR 1747

NCERT THREAD NOTES

Location — Dorsal side of forebrain

Secretions — melatonin

Functions

Regulation of 24 hr diurnal rhythm of body

Maintaining normal rhythm of sleep-wake cycle.

body temp.

Metabolism

Pigmentation

Defence capability

* Iodine is essential for normal rate of hormone synthesis in thyroid.

THE THYROID GLAND

Location & Two lobes on either side trachea

connected by a thin flap of connective tissue "Isthmus".

Secretes a protein hormone TCT which regulate blood calcium level (decrease Ca^{2+})
 → Calcium homeostasis

Follicles

Follicular cells enclosing a cavity.

T_4
 (Tetraiodothyronine or Thyroxine)

T_3
 (Triiodothyronine)

Thyroidism

Hypo

Goitre
 (enlargem. of thyroid gland)

Hyper

Due to causes of thyroid gland & due to development of nodules of thyroid glands, the rate of "synth" & "secret" becomes abnormally high

Exophthalmic goitre

• Enlargement of thyroid gland
 • Protrusion of eye ball
 • Increased basal metabolic rate
 * Weight loss
 "Grave's disease"

* Thyroid hormone :

- Regulates basal metabolic rate
- Support erythropoiesis
- Controls metabolism of protein, carbohydrates & fats.
- Maintenance of water & electrolyte balance.

→ Maturation of central nervous system

- During pregnancy
- Defect. dev. & matur. of growing baby
- Stunted growth (cretinism)
- mental retardation
- low intelligence quotient.
- abnormal skin
- dwarfism
- In adult women, irregular menstrual cycle

PARATHYROID GLAND

"Four glands present"

Location : Back side of thyroid gland
One pair each in two lobes of thyroid gland

Secretes : PTH → peptide hormone



Its secretion is regulated by circulating levels of calcium ions.

Function :

→ PTH, ↑ the Ca^{2+} in blood.

→ PTH, acts on bones & stimulates bone resorption (dissolution/demineralisation)

→ PTH, stimulates reabsorption of Ca^{2+} by renal tubule & ↑ Ca^{2+} absorption from digested food.

→ Hypercalcaemic

Along with TCT, balances calcium levels in body

TANISHA SACHAN

AIR 1747

NCERT THREAD NOTES

Thymus

TANISHA SACHAN

AIR 1747

NCERT THREAD NOTES

"Lobular structure"

~~Function~~ : b/w lungs
Location : behind sternum

On ventral side of aorta

Function : Develop. of immune system.

Secretes : Thymosin → peptide hormone

↳ helps in differentiation of T-lymphocytes

↓
provide cell mediated immunity.

* Thymosin also promote prod. of antibodies
hence to provide humoral immunity.

* Thymus → degenerated → Old individuals

↓
Decreased production
of thymosin

Immune responses of
old person become
weak.

ADRENAL GLAND

(One pair)
(anterior part of each kidney)

corticoids

↑
"secrete many hormones"

Centrally located
(Adrenal Medulla)

Outside
(Adrenal cortex)

- Adrenaline/epinephrine
- Noradrenaline/norepinephrine

Catecholamine

Rapidly secreted in response to stress of any kind & during emergency situation

"emergency hormones"
"Hormones of fight or flight"

These hormones ↑

- Alertness
- Pupillary dilation
- Piloerection
- Sweating
- Heart beat
- Strengthening of heart contract.
- Rate of resp.
- Glycogenolysis (glucose ↑ in blood)
- Lipolysis
- Proteolysis

Zona reticularis

inner

↓
secretion

Zona fasciculata

middle

↓
glucose

Zona glomerulosa

outer

↓
mineralocorticoids

Corticoids

Glucocorticoid

→ involved in carb. hydrate metab.

→ Main glucocort.

Cortisol

• Stimulate:

- Gluconeogenesis
- Lipolysis
- Proteolysis
- Inhibit cellular uptake
- Utilisation of amino acids

• Maintaining
① cardiovascular system
② kidney funct.

• Stimulate GFR

• Anti-inflammatory react.

• Suppress immune response

• Stimulate RBC production

Mineralocorticoids

→ Regulate balance of water & electrolytes

→ Main mineralocort.

Aldosterone

Acts on renal tubules

Stimulate:

- Reabsorp. of Na⁺ & water
- Excretion of K⁺ & phosphate ion

Maintains:

Electrolyte

body fluid volume

osmotic press.

Blood press.

Inflammatory rxn - Basophils

Anti-inflammatory rxn - Glucocorticoids

Androgenic steroids

by cortex

growth of

- axial hair
- pubic hair
- facial hair

during puberty.

TANISHA SACHAN

AIR 1747

NCERT THREAD NOTES

PANCREAS

Composite gland.
(acts as both exo & endocrine gland)

TANISHA SACHAN

AIR 1747

NCERT THREAD NOTES

Exocrine

↓
Enzymes

Digestion related

endocrine

1 to 2 million islets of Langerhans.

This is only 1-2% of pancreatic tissue!

TESTIS

A pair in scrotal sac (outside abdomen)

Perform dual function

Primary sex organ

Endocrine gland.

Testis

Seminiferous tubules

Interstitial or Stromal tissue

* Leydig cells / Interstitial cell

present in intertubular space

produce androgen mainly testosterone.

Regulate development & maturation of male accessory sex organ

- epididymis
- Vas deferens
- Seminal vesicle
- Prostate
- Urethra

These hormones stimulate

- Muscular growth
- growth of facial / axillary hair
- aggressiveness
- low pitch of voice

Androgens play stimulatory role in → spermatogenesis

act on CNS & influence male sexual behaviour (libido)

synthetic

→ Anabolic effect on protein & carbohydrate metabolism

α-cell

glucagon

"Peptide hormone"

→ Maintains normal blood glucose level

→ Acts on liver cell (hepatocyte)

→ glycogenolysis

→ hyperglycemia

→ gluconeogenesis

→ Reduces the cellular glucose uptake & utilisation

Hyperglycemic hormone.

β-cell

Insulin

"peptide hormone"

→ Regulation of glucose homeostasis.

→ Acts on adipocytes & hepatocytes

→ glycogenesis

→ Hypoglycemia

→ Enhances cellular glucose uptake & utilisation

→ Rapid movement of glucose from blood to hepatocyte & adipocyte.

* Prolonged hyperglycemia

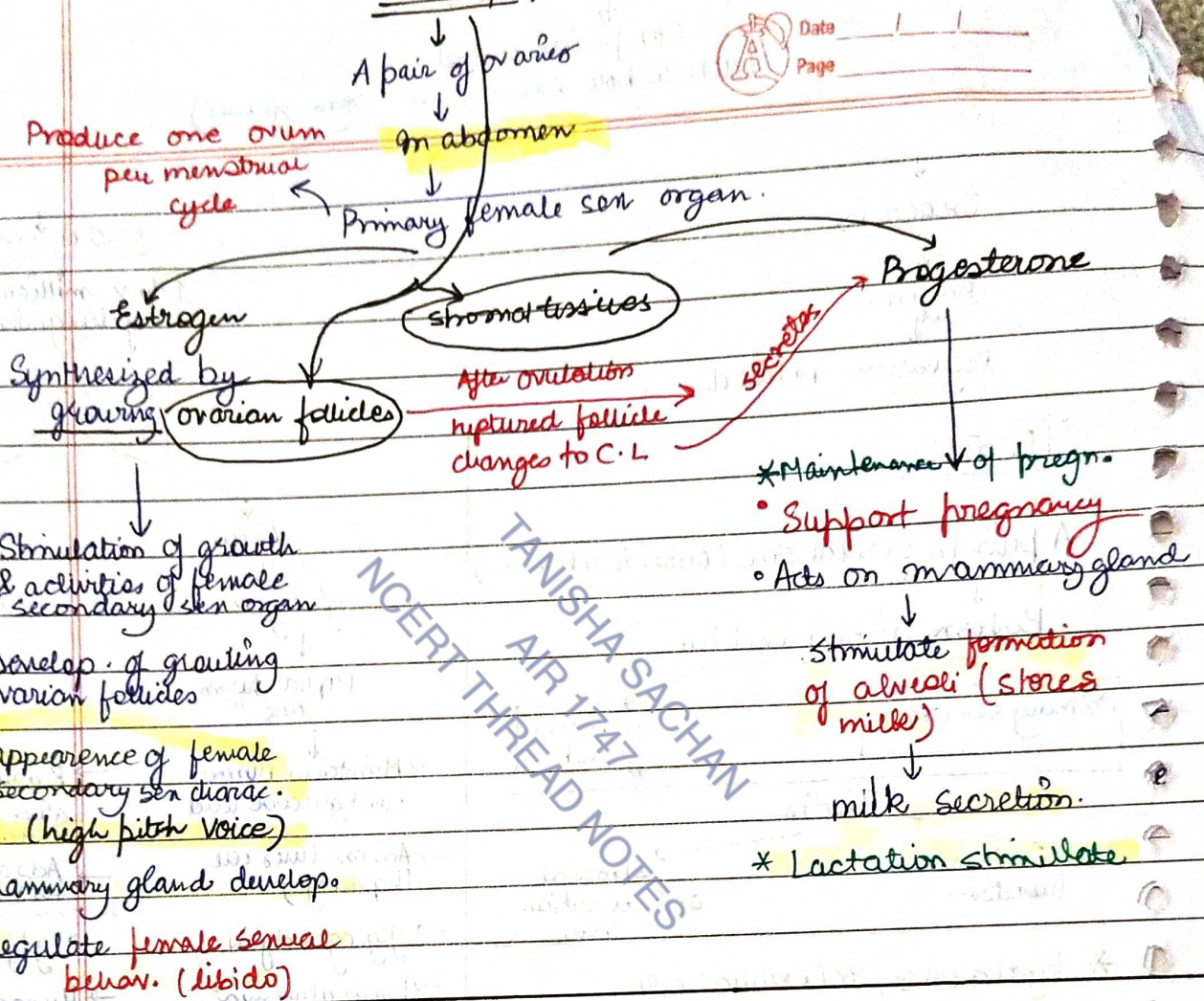
complex disorder

Diabetes Mellitus

- loss of glucose through urine
- form. of harmful comp ketone body

Diabetic patient are successfully treated with insulin therapy.

OVARY



HORMONES OF HEART, KIDNEY, GIT

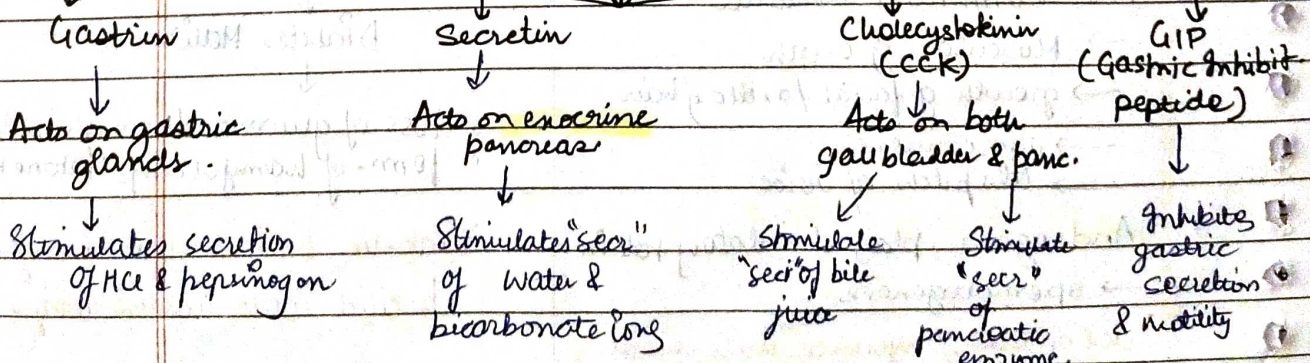
ANF → peptide hormone
by atrial wall of our heart
→ ① reduce BP ② dilation of BV

Erythropoietin → peptide hormone
by juxtaglomerular cells of kidney
→ stimulates erythropoiesis

These hormones regulate the secretion of digestive juices & help in digestion.

Endocrine cells in diff. parts of GIT

4 peptide hormones



* Several other non-endocrine tissues secrete hormones called growth factors. These factors are essential for normal growth of tissues & their repairing / regeneration.

MECH. OF HORMONE ACTION



Date

Page

- Hormones produce their effect on target tissue by binding to specific protein called hormone receptor.

located in target tissues only

Membrane bound recept.

On the cell memb. of target cell

* intracellular recept.

Inside target cell.

* Mostly nuclear receptor (inside nucleus)

* Hormone + Receptor → hormone-receptor complex.

★ Each receptor is specific to one hormone only & hence ~~receptor is specific to one hormone only~~ & hence receptor is specific.

Leads to certain biochemical changes in target tissue.

Target tissue metabolism hence physiological function are regulated by hormones

On the basis of chemical nature →

i) Peptide, polypeptide, protein

- o insulin
- o Glucagon
- o Pit. hormones
- o hypothalamic hormones
- o TCT
- o ANF
- o PTH
- o Thymosin



Date _____
Page _____

ii) Steroids



- cortisol
 - testosterone
 - estradiol
 - progesterone
 - Aldosterone
 - Sex corticoid
 - Mineral corticoid
- (All corticoids)

iii) Iodothyronines



- Thyroid hormones

iv) Amino acid derivatives



- epinephrine & nor epinephrine

Hormones which
interact with membrane
bound receptor



Do not enter target cell



Generate second messenger



cyclic AMP, IP_3 , Ca^{2+}



Regulate cellular metab.

→ PROTEIN HORMONES

→ Amino acid derivative

Hormones which
interact with
intracellular receptor



Regulate gene
expression

or

Chromosome funct.
by interact.

of hormone receptor
complex with
genome



Cumulative biochem
action

result in physiology
& developm. effects.

→ steroid

→ Iodothyronines